INFORMATION TECHNOLOGY TRENDS REPORT

1988

Ontario

The Management
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Information Technology Trends Report 1988

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Executive Summary

HIGHLIGHTS OF GENERAL TRENDS

Two major information technology trends are having an impact on virtually every office of the Ontario government. One of these trends is related to management issues, and the other to technological development.

The new trend in management is the development of long-term, ministry-wide information technology strategic plans. These plans address the ministry's total information technology needs and are also based on, and tightly linked to, each ministry's business requirements.

The major technological trend is the deployment of inexpensive personal computers (PCs) and medium-sized minicomputers linked together to meet the information needs of individual programs. Frequently, these linkages also include large centralized computers that support ministry-wide information needs.

The true potential of this new technology can only be realized with the overall view provided by the ministries' strategic plans. Conversely, the overall technology environment defined in most plans would not be achievable in any practical sense without the new technology.

Information technology is diversifying

New, fast-growth areas of development include strategic technology planning, ministry-wide data management, end-user computing support, information security, network planning and office automation support.

Program managers are obtaining more direct control of their information technology spending. For example, division-owned PCs and office automation systems have become significant parts of a ministry's total information technology expenditures.

Service bureau processing has grown more slowly than other types of computing. This is in part due to decreases in the unit charges for such computing, and in part is a result of very dramatic improvements in the price performance of smaller computers used primarily for office automation and personal computing.

NEW MANAGEMENT PROCESSES

Between 1984 and 1987, there were several changes to the processes by which information technology is managed. Strategic planning for information technology began to be introduced in all ministries. New information technology procurement procedures such as "technology tenders" and the option of a Vendor of Record have given ministries more flexibility in implementing long-term technology "architectures" or infrastructures and hence avoiding incompatibilities and piecemeal buying. Further, government-wide directives have been developed that advise on the efficient acquisition of consulting services, including those for information technology projects.

MINISTRY TECHNOLOGY INITIATIVES

Several ministries have undertaken unique initiatives over the 1985-87 timeframe that have acted as forerunners of more general trends. Examples of new technology tools now used in innovative ways throughout the government include:

- interconnected microcomputers, minicomputers and mainframes;
- electronic publishing;
- laptop personal computers;
- relational database technology;
- Information Resource Management techniques.

EXPENDITURE TRENDS

Information technology spending to reach $288 million in 1987-88

In the five-year period since 1982-83, information technology spending is expected to rise from $122 million to $288 million per year. After adjustment for inflation, this is equivalent to an average annual increase of 14 per cent. In the previous five-year period, the equivalent annual rise in spending was only 8 per cent per annum.

Ontario keeps pace with other governments

Other provinces and the federal government have also experienced significant increases in information technology costs. On a per-capita basis, Ontario spends considerably less than

Quebec, but slightly more than the federal government. However, all governments spend considerably less per employee on information technology than do comparable private sector organizations.

Salaries and computer equipment form the lion's share of expenditures

Salaries and computer equipment expenditures together account for 70 per cent of the government's information technology budget, each taking approximately the same share. Spending on data communications and consultants each account for 10 per cent of the budget. This mix has remained relatively unchanged over the past five years.

Equipment purchasing patterns are changing

Spending on personal computers and medium-sized minicomputers used primarily for office automation has risen from $16 million in 1983-84 to an expected $56 million in 1987-88, while mainframe equipment purchases have declined from $21 million to $18 million over the same four-year period.

Other areas showing significant expenditure increases have been end-user computing, office automation, data communications, and the building of information technology organizational infrastructures.

Spending in private sector remains relatively constant

Of the $288 million of information technology expenditures planned for 1987-88, $129 million or 44 per cent will be spent in the private sector. This proportion has risen modestly (from $60 million or 41 per cent in 1983-84), and fluctuates slightly from year to year.

TECHNOLOGY PENETRATION TRENDS

Penetration indicators, set up to provide a relative measure of how extensively information technology is being employed, all have shown an annual gain of approximately 20 per cent since 1984-85.

In 1986-87, there was one computer workstation for every "7.4" government employees. In 1987-88, this ratio is expected to improve to become one workstation for every 6 employees.

PERSONNEL TRENDS

The number of the Ontario government's information technology staff increased by an average of 17 per cent per annum during 1985-87. New staff were required for the high-growth areas, including:

- operations staff to support additional computers;
- Information Centre staff to support increased end-user computing;
- specialist resource personnel to support the broadening number of information technology functions;
- additional management for more complex organizational structures.

The number of personnel rose significantly, from approximately 1,500 in 1983-84 to a total of 2,400 in 1986-87. Average salaries for staff and average rates for consultants increased only at the rate of inflation over the same period.

Ratio of consultants to employees continues to decline

In 1984, as a measure to improve cost effectiveness and staff morale, the Management Board of Cabinet set a target of contracting no more than one consultant for every three employees in the information technology field. By the end of 1986-87, the ratio was 3.9 employees per consultant.

SECURITY TRENDS

Considerable progress has been made in the area of information technology security. The Management Board Secretariat has completed a comprehensive review and developed recommendations covering all aspects of security. Policy directives are now being developed in consultation with ministry managers.

The Computer and Telecommunications Services Division (CTS) of the Ministry of Government Services has restructured its two Metro Toronto data centres. One centre is now used exclusively for production, while the other is used only for systems development and backup. Ministries will be able to use the development centre for "disaster recovery" for most of their systems whenever necessary.

Information Technology Trends Report 1988

INTRODUCTION

For several years, the Management Board of Cabinet has published reports on information technology spending throughout the Ontario government, based on information reported by all ministries. This year, the report on spending includes details of expenditures on mainframes, medium-sized minicomputers, microcomputers, data communications equipment, data network services, software and related overheads.

The objectives of this report are to provide an overview of trends in information technology use throughout the Ontario government, to relate these to general industry trends, and to highlight the information technology innovations introduced in the Ontario government in 1985-87. Statistics on expenditures and other data have been collected from all ministries and then consolidated, in order to identify historical trends in the areas of spending, staffing and technology penetration.

While some comparative information is presented on individual ministries, it is not the purpose of this report to provide a detailed examination of trends at the ministry level.

The report is directed primarily at government program managers and the government's providers of information technology services. Private sector suppliers of information technology goods and services to the Ontario government may also derive some benefit from the aggregate and individual ministry statistics.

Data used in this report was collected from individual ministries in 1987-88, and covers actual expenditures in the years 1985-86, 1986-87, and estimated expenditures in 1987-88. The central data was collected following the completion of the 1986-87 fiscal year. Each ministry submitted the data on a standard questionnaire. The questionnaires were reviewed and each ministry was asked to clarify discrepancies or provide missing data. All data used to prepare this report was then approved by the respective ministry.

GENERAL TRENDS

The role of information technology in the Ontario government has changed significantly since its cautious introduction in a few accounting departments during the 1950s. Large mainframe systems appeared in the late 1960s and early 1970s. The late 1970s and early 1980s witnessed a shift towards medium-sized minicomputer applications which were tailored to the needs of individual ministry programs. Meanwhile, the mid-1980s has seen the dramatic growth in the use of personal computers (PCs) by all levels of the workforce. More and more business and office functions are being automated through personal and departmental computing and linked through telecommunications networks to central ministry business applications.

Information technology has become integral to the successful delivery of government programs. There is greater program dependence on technology. Senior ministry management is more aware of the need to better manage technology development and to achieve increased productivity in light of both budget constraints and a commitment to excellence in service to the public.

Most ministries have established information technology steering committees. Composed of senior managers, these committees direct information technology development, approve strategic plans, and set priorities. Several ministries have also created the new position of Corporate Information Executive (CIE).

In the period 1985-87 there were several developments that contributed to an extensive restructuring of the information technology environment. Information technology expenditures more than doubled in the Ontario government during this time, reflecting increased awareness and acceptance as well as the diversification of information technology. Formerly, the leviathan transaction processing systems so ideally suited to mainframe computers were required only by a few ministries. A number of other ministries have since joined this "megasystems" club (e.g., the Ministry of Revenue with OASYS and the Ministry of Consumer and Commercial Relations with POLARIS). However, the most significant changes to the information technology environment have resulted from a genera! shift toward the use of smaller, more cost-effective computers. Efficient information technology programs are now widely used in virtually all government offices.

Major developments are described here to provide a context for the interpretations of expenditure data presented later in this report.

The rise in the use of PCs

When IBM launched its personal computer in 1981, a new era of information processing began. Since then, more than 20 million PCs have been installed in North America.

At first, managers in the Ontario government were cautious about adopting the new technology. But as more experience was gained and benefits realized, PC technology became more widely used. Since 1983, more than $82 million will have been spent on purchasing 6,300 PCs and their related hardware and software. As with the private sector, these expenditures have displaced traditional mainframe-based services and contributed to the growth of information technology over the same period.

Office automation and departmental computers

The introduction in recent years of affordable "departmental" computers—computers for program-wide use that enable co-workers to network with each other—has allowed many offices to implement a broad base of office automation functions. Because of the time and cost savings involved in connecting all employees in a single branch or division to share a single set of computer applications designed for local use, department-sized computers have become a popular option for many ministries.

Shift away from service bureau processing

In the mid-1980s there has been a trend, observable in both the public and private sectors, of moving away from centralized, mainframe service-bureau processing of those computer applications that can be economically processed locally on smaller computers.

In the Ontario government, although mainframe computing continues to be essential for large-scale, transaction processing applications, many other applications are now being developed using PCs and departmental computers.

Static revenues for service bureau

While information technology spending has increased significantly, the growth of service bureau revenues has remained relatively static. The government's central service bureau for computing, the Computer and Telecommunication Services Division (CTS) of the Ministry of Government Services, decreased its charges to clients by 55 per cent between 1985 and 1987. The decrease in the cost of a unit of computing has been offset, to a large extent, by an increase in the volume of work being processed, resulting in a stable financial picture to date for CTS. However, as unit costs continue to drop it will become increasingly difficult for CTS to acquire sufficient business to maintain the current revenue level (i.e., $60 million in 1986-87).

Diversification of information technology functions

In the 1970s, the traditional functions of information technology were systems development, maintenance and the operation of transaction processing systems. In the current environment, information technology encompasses many more functions, such as:

- sophisticated word processing;
- office automation;
- voice/data/image processing;
- local and wide-area networking;
- end-user computing.

Specialists who can support these new functions are steadily being added to organizations.

Major organizational changes to manage technology

In recognition of the increased complexity, costs and importance of information technology, most ministries have reorganized to better manage it. In some ministries, information technology divisions have been formed, headed by a senior executive who reports directly to the deputy minister. Normally, this individual also assumes the role of the Corporate Information Executive (CIE) for the ministry. Such reorganization has resulted in the development and implementation of ever more ambitious information technology strategies.

Users have more direct control of purchases

The cost of most personal and departmental computers are within their users' budgets. Meanwhile, the process of strategic information technology planning has increased management's control over how its information technology dollars are to be spent. In 1987-88, it is expected that 55 per cent of all information technology expenditures will be from users' budgets; only 45 per cent will be from ministry systems budgets.

NEW MANAGEMENT PROCESSES

Some of the most significant developments to occur within the information technology arena in the Ontario government during the 1985-87 timeframe were in the processes used to manage the information technology function. The effects of these developments have been far-reaching for a number of ministries.

The introduction of new management processes was prompted by a range of information technology strategies developed between 1984-86 and issued in 1986-87 after approval by the Management Board of Cabinet. These strategies encouraged more ministry responsibility and its attendant accountability.

The major innovations serving to improve the process of management of information technology are detailed below.

Information technology strategic planning

In 1988, the Management Board of Cabinet approved directives requiring all ministries to develop strategic plans for information technology. Before this time, however, some ministries, such as Correctional Services and Community and Social Services, had already completed strategic plans based on interim guidelines made available in 1986-87. These ministries received approval of their strategic plans by the Management Board as early as September 1986.

This strategic planning process has changed significantly the approaches used to manage information technology in these ministries. The Ministry of Correctional Services, for instance, has accelerated its investment in information technology. It is building a ministry-wide "Adult and Young Offender System" that has been recognized as the best of its kind in Canada. It will provide a registration inventory and tracking system for all offenders in the province. The ministry is also developing a communications network for the system that will allow all its regional and central offices to network with each other as well as provide better controls and greater efficiencies in every area of offender management.

Meanwhile, Correctional Services has established a data centre designed to improve the productivity of its systems development teams. The ministry also plans to build a major data centre in North Bay to handle operational needs.

By mid-1988, five ministries had their strategic technology plans approved; six others were in the process of approval.

Consulting services

A new Management Board directive was issued in 1985 concerning the acquisition of consulting services, including consultants for information technology assignments. This directive clarifies responsibilities of both ministries and consultants and sharpens the competitive process used to acquire consultants. The need for measurable deliverables in all consulting assignments is emphasized.

The directive also delegates more authority to individual ministries by raising the agreement ceiling price over which Management Board approval is required to $250,000. The Ontario government's first annual report to the Management Board on consulting services showed that most ministries have acted responsibly in managing this newly delegated authority.

Technology tender process

As part of the strategic planning process, managers may elect to issue a "technology tender" to determine the technology "architectures" or infrastructures that may be used within their ministry. While the technology tender does not establish a particular vendor, it does allow ministries to standardize their architectures around the defined technologies of the various computer manufacturers. Once a technology architecture is established, competitive tenders are then only sought from suppliers of equipment which conforms to that architecture.

Ministries may issue separate technology tenders for the various components of their information technology plan, such as mainframe processing, departmental processors, and office automation and data communication networks.

Technology tenders have been used successfully by several ministries to select an architecture for their office systems. The Ministry of Health, for example, used them to establish ministry-wide standards for office processing and office communications, including electronic mail. The ministry currently has several offices and more than 400 users on its system. The increased level of communication now being witnessed is expected to improve service delivery for several important ministry programs.

Vendor of Record

Ministries may tender for a Vendor of Record to supply specific types of equipment and services, for specific purposes, for a fixed duration, and up to a fixed price ceiling. This has become a popular approach with ministries, particularly with regard to the acquisition of PC hardware and software.

For example, the Ministry of Labour sought a Vendor of Record in acquiring their PCs. The ministry replaced piecemeal buying of PCs with one tender that selected a vendor for a specific time period, up to a maximum dollar amount approved by the Management Board.

The result of this approach has been significant savings due to volume discounting and more hardware and software compatibility. In addition, both the vendor community and the government have been saved the expense of issuing and responding to dozens of smaller tenders for PCs.

MINISTRY TECHNOLOGY INITIATIVES

Certain ministry initiatives have acted as the building blocks of future, more sophisticated information systems. Some of these building blocks are described below.

Information Resource Management

For most organizations during the sixties and seventies, computer hardware and software were considered the major information technology assets. Today, most of the ministries of the Ontario government have also committed to managing information itself as a strategic resource.

This commitment has prompted a number of studies of ministry program and administrative data. New architectures are being built around critical subject databases. The management and the sharing of data are recognized as critical success factors in the development of new systems.

Ministries such as Community and Social Services have done extensive modelling of their data and hence will be well positioned to better administer, secure, relate to and access it as new applications are built.

Relational database technology

With increased emphasis being placed on the management and sharing of information, several ministries have selected "relational database technology" as a database strategy.

The Ministry of Community and Social Services is in the process of implementing a relational database product throughout the ministry at both the mini- and microcomputer levels. Most ministries believe that this technology will provide substantial benefits to future application development and operations.

Shift away from "stand-alone" computing

There has been a major shift by most ministries away from "stand-alone" computing. This has been achieved through local-area networks (LANs), and interconnected minicomputers and mainframe systems.

The Management Board Secretariat was one of the first organizations in the government to implement ministry-wide PC-based LANs, in 1984-85. This approach combines intelligent desktop processing for all management, professional and support staff with document and message communications capability. It has enhanced the allocations/estimates process, as

spreadsheet software has allowed faster and more complete analysis of ministry submissions.

Automating fieldwork with laptops

Innovation was demonstrated by the Ministry of Revenue in introducing laptop computers to its field-audit staff as a productivity measure. This application has been very successful.

The use of laptops in the Ontario government is expected to increase as further uses for them are found in the fieldwork of other ministries.

Electronic publishing

The evolution of PC technology coupled with software development for word processing and publishing has meant that electronic or desktop publishing has emerged as another viable use of technology.

Because of its flexibility and low cost, PC-based electronic publishing has the potential of displacing expensive printing services. For example, the Computer and Telecommunications Services Division of the Ministry of Government Services makes use of electronic publishing to publish bulletins and newsletters.

EXPENDITURE TRENDS

Overall spending is rising

Overall government spending on information technology has grown from $122 million in 1982-83 to a planned $288 million in 1987-88—an average annual increase, after adjusting for inflation, of 14 per cent. In the previous five years, the corresponding growth rate was only 8 per cent per annum (see the appendix tables 7 and 8 on page 17).

Information technology spending has continued to grow faster than overall government spending. Between 1982 and 1987, average overall government spending grew 3 per cent per annum (after adjusting for inflation), while in the previous five-year period, overall spending had simply matched the inflation rate.

In 1986-87, there was an increase in overall government spending of about 10 per cent (after adjusting for inflation) over the previous year. But in that same year, information technology (inflation-adjusted) expenditures rose 32 per cent over the previous year.

Estimates provided for 1987-88 indicate that the rate of growth of technology expenditures has been slowing down. An inflation-adjusted expenditure increase of 4.4 per cent has been forecast (see appendix table 8 on page 17).

The overall rapid rise in technology spending witnessed so far has been due to a combination of many factors. Some of these factors are presented below.

- Information technology has been given much higher priority as a way of delivering more service to the public.
- In the development of traditional transaction processing systems, systems development costs usually precede the full impact of operational costs by one or more years. However, in office automation and other "turn-key" applications, implementation is often immediate, thereby accelerating the spending pattern (but also the achievement of benefits).

- With more applications now being developed on minicomputers, it is more often necessary to purchase hardware for systems developers at the beginning of the project. In the past, when traditional systems were developed on service bureau hardware, projects were charged only for the *shared* computing resources actually consumed.
- In 1986-87, the government accelerated investments in certain information technology projects as part of its service-improvement initiatives.

It is not entirely clear whether the slowdown forecast for 1987-88 represents the end of a cycle or simply a pause in a sustained period of rapid growth. New Management Board directives now require ministries to develop long-term strategic plans for information technology. The modest increase in 1987-88 may simply reflect more time taken for planning and assimilating the equipment already purchased. From the strategic planning that has already been completed, there is every indication that many ministries will soon embark on a very strong systems development cycle, and overall costs can be expected to continue rising in the foreseeable future.

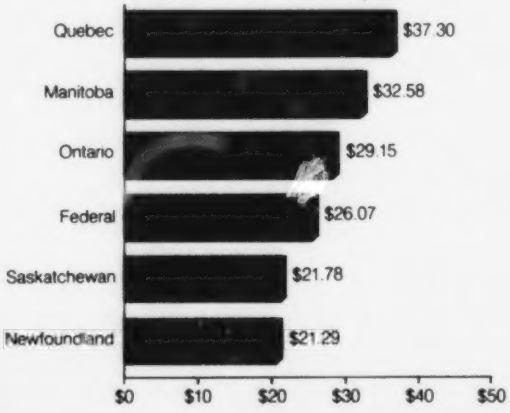
Ontario per capita expenditures similar to other governments

As shown in Figure 1, in terms of *per-capita* expenditures, Ontario falls in the middle of the five provincial governments listed—two spend more than Ontario and two spend less—and it also somewhat outspends the federal government.

In *absolute* terms, the federal government, with total 1986-87 expenditures reaching $661 million, has the largest information technology budget amongst governments in Canada. Ontario, with expenditures of $265 million, ranks second, followed by Quebec with $243 million. Both the federal and Quebec governments have also experienced significant rises in their information technology expenses.

However, all governments spend considerably less per employee than private sector organizations do on information technology.

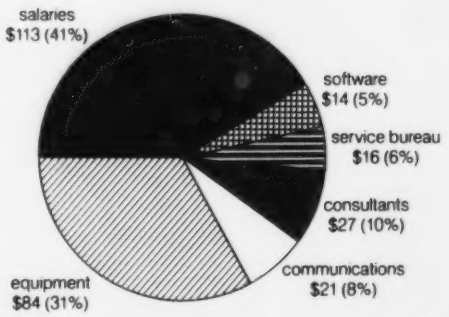
Figure 1
Information Technology Spending—Per Capita Comparisons, 1986-87



Distribution of expenses relatively unchanged since 1983-84

Figure 2 shows the distribution of information technology expenditures projected for 1987-88. How information technology expenses are distributed—how the information technology "pie" shown in Figure 2 is sliced—tends to vary only somewhat from year to year despite the overall rapid rise in technology spending. There has been no real change in the distribution of expenditures since 1983-84. For example, *computer equipment* spending has ranged between 31 per cent and 38 per cent of total expenditures. *Salaries* for information technology personnel have accounted for between 36 per cent and 41 per cent of total

Figure 2
Information Technology Spending—Projected Distribution, 1987-88
(in $ millions)



Total: $275 million*

* This total is less than the 87-88 estimate appearing elsewhere due to accounting differences relating to CTS charges.

spending. Data *communications* and computer *consultants* currently each represent about 10 per cent of the total. Expenses for purchased and leased *software* have increased from 3 per cent in 1983-84 to a projected 5 per cent of total expenses.

Significant changes in resource use

In Table 1, expenditures are broken down into broad inforrnation technology functions or categories.

Expenditures on *data processing services and operations*, which consist mainly of services provided by CTS, have shown only moderate growth—an average of 11 per cent per annum over the period from 1980-81 to 1987-88. However, purchases of computer *hardware*, excluding PCs, have risen at an average annual rate of 28 per cent, indicating a definite shift from remote mainframes to minicomputers. This trend is also being experienced in private sector service bureaus.

Data communications costs, once expected to become a significant component of the information technology budget, have leveled off since 1984-85, probably reflecting the shift away from central service bureau processing towards departmental minicomputers.

Systems development and *systems maintenance* costs show moderate increases as users become attracted to the more immediate payoffs of PCs and office automation. However, a large increase in systems development costs has been projected for 1987-88, and there are indications that a sustained increase in systems development costs will continue as ministries begin to implement their strategic plans.

In 1987-88, systems maintenance accounts for 5 per cent of all projected expenditures, an improvement from the 1980-81 figure of 9 per cent.

Spending on *end-user computing*, a category which covers expenditures related to PC hardware and software, wages of information centre support staff, and office automation (OA), now accounts for 12 per cent of all expenditures on information technology. This figure is probably understated, as many of the minicomputers now being used to perform office automation functions were primarily purchased for other purposes.

Systems administration, a category consisting primarily of personnel expenditures on management, administrative support, and other specialized staff for security, planning, information resource management, etc., has risen from being 5 per cent of total information technology expenditures in 1980-81 to a projected 18 per cent in 1987-88. This rapid rise reflects both the expanding role of information technology into new administrative areas such as strategic planning, information security, ministry-wide data management, etc., and also the building of organizational infrastructures to support this expansion.

Equipment purchasing patterns changing

In 1983-84, more than 40 per cent of the computer equipment purchased by the Ontario government was for the central service bureau (CTS). By 1987-88, purchases for CTS are expected to drop to less than 20 per cent. Minicomputer purchases by ministries over the same period are expected to rise from $7 million to $29 million—a 315 per cent increase.

Purchases of PCs, peripherals, local-area

TABLE 1: INFORMATION TECHNOLOGY SPENDING BY FUNCTION, 1980-81 TO 1987-88

	Fiscal year ending								Average annual growth (%)	Percentage of total	
	81	82	83	84	85	86	87	88*		81	88*
	($ million)										
Data processing services & operations (incl. CTS)	44	46	53	61	61	72	79	92	11	55	32
Hardware (excl. PCs)	8	11	14	20	24	28	53	46	28	10	16
Data communications	1	2	3	8	12	9	11	11	38	1	4
Systems development	15	20	33	15	16	17	24	36	14	19	13
Systems maintenance	7	10	12	14	14	15	16	15	11	9	5
End-user computing (incl. PCs, OA)	–	–	–	11	17	22	41	35	33	–	12
Systems administration	4	6	8	17	20	30	41	52	45	5	18
Total	**79**	**95**	**122**	**146**	**165**	**194**	**266**	**288**	20%	100	100

NOTE: *denotes estimate

networks and software have increased from $5 million in 1983-84 to a projected $25 million in 1987-88. Over this five-year period, the Ontario government will have spent almost $90 million for the purchase of 6,300 microcomputers and related software and local-area networks, at an average cost of $14,300 per station.

Expenditures exceed estimates

Actual overall expenditures for information technology have exceeded projected estimates of expenses in recent years. In 1983-84, actual expenses exceeded estimates by 4 per cent. In 1984-85 expenditures went on to exceed estimates by 11 per cent. The variance dropped back to approximately 6 per cent in 1985-86 (see appendix table 16 on page 22).

Those ministries with smaller information technology budgets tend to exceed their spending plans to a greater degree than ministries with large budgets. Over the three-year period from 1983-84 to 1985-86, the group of sixteen ministries with information technology budgets under $8 million exceeded projected expenditures by an average of 30 per cent, while the group of eleven ministries with budgets over $8 million exceeded projections by an average of only 4.5 per cent (see appendix table 18 on page 24).

Much of the variance in the group of ministries with smaller budgets can be attributed to the fact that the sizes of their technology budgets are low in absolute terms, so that even small overruns cause large percentage variances. Further, this group contains several ministries in start-up situations that reported little or no initial budget.

Proportion of private sector spending relatively unchanged

Overall, the proportion of the government's total information technology budget that is spent directly in the private sector has fluctuated between 41 per cent and 49 per cent since 1983-84, with 44 per cent expected to be spent in this sector in 1987-88.

In absolute terms, the value of government information technology spending in the private sector has risen from $60 million in 1983-84 to an expected $129 million in 1987-88 (see appendix table 10 on page 17).

Personnel costs and computing costs are the two largest categories of expenses in the overall information technology budget. Both have been rising at roughly the same rate since 1983-84, and have tended to maintain the balance between government spending in the private sector and that spent internally.

As for personnel costs, internal staffing has risen most rapidly, while increases in the uses of contract personnel have been more modest.

For computing costs, the trend has been away from service bureaus and towards ministries acquiring equipment directly.

TECHNOLOGY PENETRATION TRENDS

The *cost* of an investment can usually be measured more accurately than the *return* on an investment. It is difficult to detail all the results arising from the sizable investments in information technology made over the past decade. It is one thing to presume that white-collar productivity is increasing: it is a much more daunting task to measure it. A measurement of the more intangible benefits of the growth in information processing, such as improved management effectiveness, is even more elusive. Both tasks are beyond the scope of this report.

However, three indicators exist that can act as yardsticks for the measurement of technology penetration trends, and these are presented in Table 2. The *employees per workstation* and *information technology spending per employee* indicators shown in the table point to the extent to which information technology is used on the job for the Ontario government overall. The other indicator is *information technology budget to ministry total*, or information technology spending as a proportion of the organization's total budget. These three indicators can be used to compare ministries with each other, other governments or with private sector organizations.

When comparing individual ministries and private sector organizations, it is important to remember that the government has about 11,000 positions not usually considered to be traditional white-collar jobs, such as firefighters, social workers, prison guards, health-care workers, roads-maintenance employees, etc. Terminals are not as prevalent for these types of positions and consequently there are fewer machines than, for example, for a financial institution. As a result, any "per employee" yardsticks cannot always be compared directly.

Technology penetration increases at roughly 20 per cent annually

Table 2 shows technology penetration indicators for the Ontario government overall over the three-year period from 1984-85 to 1986-87. The average annual gain shown by these indicators is approximately 20 per cent.

In 1986-87, there was one computer workstation for every 7.4 government employees. In 1987-88, this ratio is expected to be one for every 6 employees.

Table 3 on page 12 shows the technology penetration indicators presented in the previous table, but this time for individual ministries. The table shows a wide degree of variation of information technology penetration within the Ontario government. From ministry to ministry, the *information technology spending per employee* indicator varies from less than $1,000 to more than $9,400 per annum, while *employees per workstation* ranges from 1.6 to 25 in 1986-87. Note, however, that much of the variation evident in Table 3 can be accounted for by the difference in the nature of the work done by these ministries.

Ontario in line with federal and Quebec governments

Table 4 shows technology penetration indicators for the federal and the two largest provincial governments. All spend roughly the same amount per employee on information technology (see Figure 1 on page 8). The *federal* figure in Table 4 showing per-employee spending on information technology may be somewhat understated, as it does not include all expenditures on office automation and end-user computing. In terms of employees per workstation, Ontario is slightly behind the federal and Quebec governments.

Private sector comparisons

Table 5 shows technology penetration indicators for primarily white-collar organizations that have intensive information processing

TABLE 2: TECHNOLOGY PENETRATION INDICATORS, 1984-85 AND 1986-87

Indicator	1984-85	1986-87	Average annual gain
Employees per workstation	11.3	7.4	24%
Information technology spending per employee	$2,072	$3,133	23%
Information technology budget to ministries' total	3.8%	5.2%	17%

TABLE 3: TECHNOLOGY PENETRATION INDICATORS BY MINISTRY
(in ascending sequence of number of employees per workstation in 1986-87)

	1984-85			1986-87			Average annual gain (%)		
	employees per ws	IT per employee ($)	IT as % of total	employees per ws	IT per employee ($)	IT as % of total	employees per ws	IT per employee ($)	IT as % of total
Colleges & Universities	–	–	–	1.6	8,620	29.8	–	–	–
Housing	3.2	7,845	15.2	1.6	9,484	20.0	42	10	15
Treasury & Economics	2.0	6,687	1.3	1.6	8,739	6.0	10	14	111
Management Board/HRS	2.4	6,739	1.3	1.8	4,730	1.0	16	–16	–9
Revenue	4.1	4,917	11.8	2.7	5,811	12.5	23	9	3
Industry, Trade & Tech.	5.1	4,146	4.3	2.7	4,224	4.9	37	1	7
Municipal Affairs	–	–	–	3.3	5,908	–	–	–	–
Consumer & Commercial Rel.	6.9	3,280	9.3	3.4	3,675	9.5	42	6	1
Labour	12.1	1,646	3.7	4.7	4,453	8.2	60	64	50
Northern Dev. & Mines	11.7	1,667	0.4	4.9	5,346	3.1	55	79	191
Skills Development	–	–	–	5.0	5,671	8.3	–	–	–
Intergovernmental Affairs	4.5	566	0.7	5.8	1,368	1.7	–13	55	54
Education	11.9	2,482	5.4	5.9	7,383	12.7	42	72	54
Environment	20.1	1,941	2.8	6.7	3,923	4.7	73	42	30
Agriculture & Food	6.0	2,421	4.8	6.7	3,731	6.6	–5	24	18
Natural Resources	13.2	1,558	2.2	7.4	3,743	4.4	34	55	41
Transportation	7.1	3,354	5.1	7.8	4,348	5.5	–5	14	4
Health	19.0	1,318	3.8	8.5	2,093	4.9	50	26	14
Culture & Communications	21.0	981	2.4	9.9	1,591	3.8	45	27	27
Tourism & Recreation	14.1	2,389	3.5	10.3	1,652	2.4	17	–17	–18
Energy	7.5	2,148	1.4	10.3	4,845	3.3	–15	50	56
Government Services (excl. CTS)	11.1	3,478	3.0	14.5	3,082	2.4	–12	–6	–11
Solicitor General	25.5	894	1.9	15.3	1,514	2.8	29	30	20
Correctional Services	18.6	444	1.2	15.6	987	2.1	9	49	33
Attorney General	32.7	1,183	3.1	16.9	2,223	4.8	39	37	24
Financial Institutions	–	–	–	17.5	1,525	2.5	–	–	–
Community & Social Services	35.5	1,186	3.4	25.8	1,960	4.9	17	29	21
Total all ministries	11.3	$2,072	3.8%	7.4	$3,133	5.2%	24	$23	17%

NOTES: employees per ws = employees per workstation
IT per employee = information technology spending per employee
IT as % of total = information technology budget to ministry total

requirements. Information obtained from a chartered bank and a large insurance company is compared to that obtained for the Ontario Ministry of Revenue, the ministry closest in nature to the private sector organizations presented in terms of the nature of the work performed.

Note that the Ministry of Revenue spends substantially less per employee on information technology than either the insurance company or the bank. Yet in terms of the more visible sign of automation—the number of employees per workstation—this ministry now has approximately the same number as the chartered bank, although still about twice as many employees per workstation as the insurance company. Nonetheless, recall that caution is required in drawing conclusions from

TABLE 4: TECHNOLOGY PENETRATION INDICATORS BY GOVERNMENT, 1986-87

Government	Spending per employee ($)	Employees per workstation
Federal	2,938	6.5
Ontario	3,133	7.4
Quebec	3,432	4.6

TABLE 5: TECHNOLOGY PENETRATION INDICATORS BY ORGANIZATION, 1986-87

Organization	Spending per employee ($)	Employees per workstation
Ontario Ministry of Revenue	5,811	2.7
Insurance company	10,116	1.5
Chartered bank	14,593	2.9

comparisons such as the ones presented in Table 5. The nature of the work performed by these organizations is not in all ways similar, and the reporting procedures are in no way uniform.

PERSONNEL TRENDS

Sharp rise in numbers of information technology personnel

The increased use of information technology in the ministries has been accompanied by an increased requirement for staff. As shown in Figure 3, the total number of personnel involved in information technology rose from approximately 1,500 in 1983-84 to 2,400 in 1986-87—an average annual increase of 17 per cent.

Much of the increase was devoted not to traditional information technology functions such as systems development and maintenance, but rather to efforts to build an organizational infrastructure and to support increases in end-user computing.

In Table 6, the growth in the number of person-years dedicated to information technology personnel is tracked from 1983-84 to 1986-87 in terms of staff function.

Of the **Operations** staff, the number of computer *operations and data entry* person-years has risen quickly, probably as a consequence of large equipment investments that have been made. The number of *Information Centre and client liaison* person-years has risen even more rapidly, due both to the increased need for PC support and also the increased emphasis on providing service to user areas.

Figure 3
Information Technology Personnel

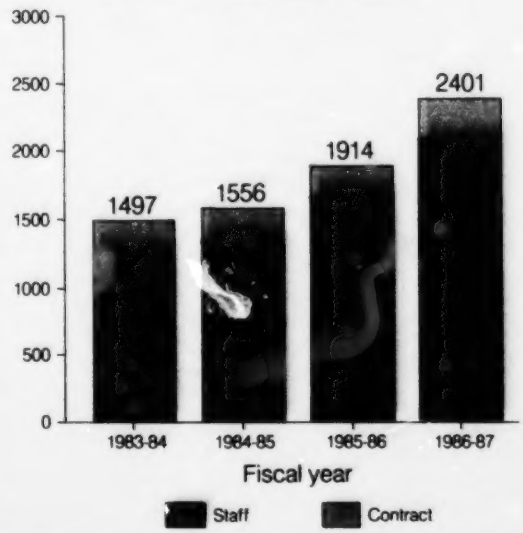


TABLE 6: GROWTH IN INFORMATION TECHNOLOGY PERSON-YEARS

Function	Person-years 1983-84	1986-87	Average annual growth %
Operations			
Operations & data entry	348	623	21
Systems maintenance	341	364	2
Information Centre & client liaison	98	217	31
Subtotal	787	1,204	15
Systems Development			
Software development	355	530	14
Development & infrastructure support	37	183	71
Subtotal	392	713	22
Administration			
Management	125	261	28
Administrative and project support	193	222	5
Subtotal	318	483	15
Total	**1,497**	**2,400**	**17%**

In **Systems Development**, growth in *software development* person-years has been moderate, at 14 per cent per annum, but with most of the increase occurring in 1986-87. Based on estimates for 1987-88, however, numbers are expected to increase sharply again.

Meanwhile, the number of *development and infrastructure support* staff has risen extremely rapidly, with staff person-years rising at 71 per cent per annum—partly because the base figure in 1983-84 was so low. In addition, this category applies to an increasingly diverse range of tasks, including database administration, integrated resource management, network planning, strategic planning, and information security. Now that the scope of information technology has broadened, so has the need for additional specialized positions. Further, person-years related to major feasibility studies undertaken by consultants have been included under this heading.

The management of information technology's broadening mandate has become more complex, giving rise to a noticeable increase in *management* positions (a 28 per cent per annum increase in person-years) under the **Administration** component of Table 6. However, *administrative and project support* person-years have only risen at an average rate of 5 per cent, so that the total administration increase is 15 per cent—a figure that is consistent with the government-wide average annual growth rate (17 per cent) of person-years for information technology personnel.

Costs for personnel rise at the same rate as inflation

While the numbers of personnel have risen rapidly, the cost per person has followed the general government levels of increases that roughly match inflation. From 1983-84 to 1986-87, the average cost per person working in an information technology position rose at an average annual rate of 4.3 per cent.

Ratio of consultants to employees continues to decline

In 1982, the Ontario Systems Council, as part of a larger study of information technology staffing and recruiting problems, examined the use of information technology consultants. Following this study, in 1984, the Management Board implemented a Systems Staffing Adjustment Initiative that established a target ratio of three employees to one consultant in systems functions. This ratio was achieved by 1983-84 and by 1986 reached a comfortable average level of almost four employees to one consultant.

The average cost for contract personnel grew at only 3.33 per cent per annum since 1984, probably reflecting the reduced demand.

SECURITY TRENDS

The 1983-85 report on *Information Technology in the Ontario Government* indicated that there had been considerable ministry activity in implementing the interim guideline on information technology security issued by Management Board in January 1984.

Since then, two major activities have fostered a more comprehensive implementation of security measures across the government: the development of information technology security strategies, and the implementation of a disaster recovery facility.

Security Strategies Report

The Management Board Secretariat has completed a comprehensive review of the management measures required to implement information technology security programs in the government. The findings and recommendations of that review were presented to the Management Board in December 1987.

These findings and recommendations cover all aspects of security, namely:

- confidentiality—safeguarding information by limiting access to those with appropriate authorization and a need to know (What information is sensitive and needs to be protected has been determined largely by the *Freedom of Information and Protection of Privacy Act*);
- integrity—the accuracy and completeness of information in the computer environment;
- availability—the measures necessary for ensuring the availability of information to government programs and to the public.

The recommendations in the strategy report are comprehensive and promote employee awareness and participation in security management programs, the need for formal controls, contingency planning at the government and ministry level, and funding considerations.

The report was distributed to all ministries for review prior to presentation to the Management Board. Policy directives on the subject are now being developed for review by the ministries.

Disaster recovery facility

The Computer and Telecommunications Services Division (CTS) has restructured its two Metro Toronto data centres. All production now takes place at the Downsview Data Centre so that the Queen's Park Data Centre can be dedicated to development processing. CTS is also installing a high speed data-transmission capability between these two data centres.

These developments mean that the Queen's Park site can provide a disaster-recovery facility for all production systems operating at Downsview. This facility will be provided on a cost-recovery basis to ministries requesting the service.

The new arrangement will also allow the testing of contingency plans at the Queen's Park data centre.

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NOTE: All figures for fiscal years 1987-88 are estimates.

TABLE 7: INFORMATION TECHNOLOGY SPENDING, ONTARIO GOVERNMENT 1978–88 ($ million)

	Fiscal year ending										Average growth rate (over 5-year periods)	
	79*	80*	81*	82*	83*	84	85	86	87	88*	78-83	83-88
Systems development	17.5	15.4	20.4	27.3	41.0	28.2	29.9	36.0	50.2	68.2	23%	11%
Systems maintenance	7.5	9.6	12.2	15.7	18.6	23.8	24.4	24.0	26.7	27.6	23%	8%
Systems operations	36.7	47.8	46.3	51.8	62.6	78.8	88.9	98.1	131.3	137.5	15%	17%
User computing & OA	–	–	–	–	–	15.4	22.1	35.5	57.5	55.2	–	38%
Total	**61.7**	**72.8**	**79.0**	**94.8**	**122.2**	**146.1**	**165.3**	**193.6**	**265.7**	**288.5**	19%	19%

NOTE: * denotes estimate

TABLE 8: PERCENTAGE GROWTH RATES OF INFORMATION TECHNOLOGY SPENDING, ONTARIO GOVERNMENT 1978–88 (inflation-adjusted)

	Fiscal year ending										Five-year periods	
	79*	80*	81*	82*	83*	84	85	86	87	88*	78-83	83-88
Systems development	11.2	–19.3	21.8	18.5	35.6	–35.0	1.6	15.9	34.1	30.6	12	6
Systems maintenance	3.2	17.4	16.3	14.8	6.8	20.7	–1.5	–5.5	7.0	–0.6	12	4
Systems operations	10.2	19.4	–11.0	–0.6	9.0	18.9	8.1	6.1	28.7	0.7	5	12
User computing & OA	–	–	–	–	–	–	37.5	54.2	55.7	–7.7	–	33
Total	**9.6**	**8.2**	**–0.5**	**6.7**	**16.3**	**13.0**	**8.4**	**12.1**	**32.0**	**4.4**	**8**	**14**
(Growth in total spending)				(–3.6)	(–2.4)	(7.3)	(–1.9)	(–4.6)	(10.1)	(4.4)		

NOTE: * denotes estimate

TABLE 9: EXPENSE COMPONENTS AS A PERCENT OF TOTAL INFORMATION TECHNOLOGY SPENDING, ONTARIO GOVERNMENT 1978–88

	Fiscal year ending									
	79*	80*	81*	82*	83*	84	85	86	87	88*
Systems development	28.4	21.2	25.9	28.8	33.5	19.3	18.1	18.6	18.9	23.6
Systems maintenance	12.2	13.2	15.4	16.6	15.2	16.3	14.8	12.4	10.0	9.6
Systems operations	59.5	65.7	58.7	54.7	51.2	53.9	53.8	50.7	49.4	47.7
User computing & OA	–	–	–	–	–	10.6	13.4	18.3	21.6	19.1
	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

NOTE: * denotes estimate

TABLE 10: USE OF PRIVATE VS. PUBLIC SECTOR RESOURCES, ONTARIO GOVERNMENT 1983–1988 ($ thousands)

	1983-84		1984-85		1985-86		1986-87		1987-88*	
	Private	Public	Private	Public	Private	Public	Private	Public	Private	Public
Data processing services[1]	7,815	42,802	6,711	44,137	7,893	44,240	7,015	46,743	7,711	54,619
Data processing support	2,609	376	2,288	532	2,952	1,237	5,475	1,320	6,913	1,430
Equipment	27,467	–	35,873	–	41,985	–	78,751	–	63,763	–
Data communications	6,399	4,034	10,064	4,516	7,795	5,877	9,401	10,103	8,490	10,982
Systems development	8,242	6,830	7,098	8,535	5,762	11,050	9,880	14,452	13,782	22,488
Purchased software	1,393	–	3,100	–	3,454	–	6,970	–	9,117	–
Systems maintenance	4,676	9,421	4,029	10,317	4,477	10,528	4,891	11,601	4,544	10,544
Info. tech. administration	1,456	22,556	1,992	26,133	7,448	38,904	9,758	49,353	14,901	59,185
	60,057	86,019	71,154	94,170	81,766	111,836	132,141	133,573	129,221	159,247
Total	**146,076**		**165,323**		**193,602**		**265,714**		**288,468**	
(% in private sector)	(41%)		(43%)		(42%)		(49%)		(44%)	

NOTE: * denotes estimate

[1] includes payments to the Computer and Telecommunications Services Division (CTS) of the Ministry of Government Services

TABLE 11: COMPUTER EQUIPMENT AND DATA COMMUNICATIONS EXPENDITURES, ONTARIO GOVERNMENT 1983–1988 ($ thousands)

	Fiscal year ending				
Equipment	84	85	86	87	88*
Computing facilities over $500,000					
• CTS	20,817	23,225	25,157	19,243	18,200
• ministries	—	—	5,815	14,120	8,584
$140,000 to $500,000	7,365	8,689	4,646	8,482	9,678
Up to $140,000 excl. PCs	—	—	9,124	14,010	10,570
Subtotal	28,182	31,914	44,741	55,855	47,032
Personal computers	4,896	9,689	13,959	29,419	24,638
Dedicated word processing	4,326	5,075	3,385	3,451	2,745
Data entry & RJE[1] terminals	4,757	4,073	2,160	2,779	2,897
Microfilm equipment	1,627	1,694	466	990	770
Special-purpose equip. (i.e., POS)[2]	—	—	323	1,587	415
Other computer facilities	5,868	8,008	4,058	6,360	5,866
Total	**49,654**	**60,452**	**69,093**	**100,441**	**84,363**
Data Communications					
Data networks—services		—	6,200	7,915	9,592
Data networks—equipment		—	2,983	1,913	2,426
Subtotal		12,730	9,183	9,828	12,018
Integrated data/voice networks		—	643	2,514	894
Local area networks		823	623	1,900	2,771
FAX services		1,986	4,342	7,055	5,672
Total		**15,540**	**14,792**	**21,297**	**31,667**
Voice Communications[3]		—	28,898	39,724	71,202
Total (incl. voice communications)		—	**43,689**	**61,021**	**102,868**

NOTES: * denotes estimate

[1] RJE = remote job entry

[2] POS = point of sale

[3] Voice communication expenses do not appear in any other tables or totals in this report.

TABLE 12: DEPLOYMENT OF INFORMATION TECHNOLOGY PERSONNEL, ONTARIO GOVERNMENT 1983–87 (in person-years)

	1983-84	1984-85	1985-86	1986-87
Software				
Appl. packages	12	15	2	12
Custom development	343	343	391	518
Appl. maintenance	332	331	338	346
Operating systems	9	12	13	19
Info. Tech. Administration				
Management	125	132	211	261
Project/admin. support	193	208	168	222
Client liaison/Info. centre	98	111	153	217
Data control/entry	216	211	285	332
Operations & facilities mgmt.	132	145	264	291
Planning/IRM[1]	0	0	65	93
Other consulting	35	42	0	72
Other expenditures	2	6	25	18
Total	**1,497**	**1,556**	**1,914**	**2,401**

NOTE: [1]IRM = Information Resource Management

TABLE 13: COSTS OF INFORMATION TECHNOLOGY PERSONNEL, ONTARIO GOVERNMENT 1983–1988 ($ thousands)

	1983-84	1984-85	1985-86	1986-87	1987-88*
Software					
Appl. packages	1,248	2,777	2,474	4,886	5,881
Custom development	15,072	15,633	16,812	24,332	36,270
Appl. maintenance	13,781	13,852	14,392	15,642	14,113
Operating systems	461	817	1,592	2,933	4,210
Info. Tech. Administration					
Management	5,347	5,835	10,220	12,692	15,163
Project/admin. support	5,592	6,645	4,621	6,450	7,219
Client liaison/Info. centre	3,214	3,826	5,544	8,212	10,709
Data control/entry	4,184	4,368	6,999	8,240	8,521
Operations & facilities mgmt.	2,878	3,338	8,897	10,275	13,095
Planning/IRM[1]	0	0	2,710	4,139	5,705
Other consulting	1,434	1,953	3,322	5,189	8,664
Other expenditures	1,363	2,160	4,040	3,915	5,009
Total	**54,574**	**61,203**	**81,623**	**106,905**	**134,559**

NOTES: * denotes estimate
[1] IRM = Information Resource Management

TABLE 14: INFORMATION TECHNOLOGY SPENDING BY MINISTRY ($ thousands)

	Fiscal year ending								Avg. annual growth rate 83-88	Rank	
	81*	82*	83*	84	85	86	87	88*	(%)	81	88*
Transportation	10,305	10,879	20,257	28,860	32,962	34,162	42,218	40,104	15	2	1
Community & Social Servs.	4,627	7,604	9,195	11,843	13,129	19,002	21,880	29,338	26	7	2
Revenue	9,548	15,775	19,811	18,348	20,031	23,316	23,861	28,572	8	3	3
Health	13,123	12,484	13,563	14,578	16,094	18,175	26,589	25,113	13	1	4
Natural Resources	3,699	3,759	3,965	7,582	8,289	11,949	21,068	21,088	40	9	5
Housing	6,523	6,450	8,738	9,579	10,175	11,168	12,093	13,955	10	4	6
Attorney General	3,989	3,659	5,759	5,380	6,260	5,364	12,222	13,644	19	8	7
Government Services (excl. CTS)	6,177	7,312	11,100	11,442	10,351	10,267	9,946	13,251	4	5	8
Consumer & Commercial Rel.	3,619	4,818	5,733	6,297	8,483	6,081	8,717	11,658	15	10	9
Solicitor General	2,884	3,897	5,240	4,862	5,892	7,387	10,228	11,155	16	12	10
Education	4,805	5,245	5,461	6,112	7,273	9,837	16,921	10,915	15	6	11
Agriculture & Food	971	1,250	1,767	3,813	4,970	5,323	8,487	10,111	42	15	12
Environment	1,356	1,628	2,781	3,864	4,489	6,313	10,051	8,803	26	13	13
Correctional Services	831	1,311	1,683	2,691	2,709	4,187	6,997	8,737	39	17	14
Labour	886	1,112	1,485	2,449	2,589	2,687	7,730	6,608	35	16	15
Skills Development	–	–	–	–	–	1,778	3,159	5,939	–	–	16
Industry & Trade	499	1,538	818	2,240	2,848	2,558	3,181	5,160	45	19	17
Northern Dev. & Mines	–	30	–	337	370	1,562	3,710	4,230	88	21	18
Treasury & Economics	3,486	2,955	2,944	2,754	3,043	3,813	3,775	3,757	5	11	19
Colleges & Universities	–	–	–	–	–	245	2,302	3,513	–	–	20
Municipal Affairs	–	–	–	–	–	2,535	3,267	3,196	–	–	21
Tourism & Recreation	–	–	–	1,335	1,715	1,303	1,550	2,849	–	–	22
Management Board/HRS	540	579	1,053	729	2,251	1,875	2,015	2,460	18	18	23
Culture & Communications	1,087	1,013	776	628	803	1,735	1,564	1,693	17	14	24
Energy	–	–	45	259	550	877	1,100	957	84	20	25
Financial Institutions	–	–	–	–	–	–	561	873	–	–	26
Office of the Cabinet	–	–	–	–	–	69	387	739	–	–	27
Office of the Premier	–	–	–	–	–	18	33	50	–	–	28
Intergovernmental Affairs	–	1,472	–	95	50	18	104	–	–	–	29
Total	**78,953**	**94,769**	**122,171**	**146,075**	**165,324**	**193,602**	**265,714**	**288,468**	19%		

NOTE: * denotes estimate

TABLE 15: TECHNOLOGY PENETRATION INDICATORS—RAW DATA BY MINISTRY, 1986–87

	Info tech spending ($ thousands)	Ministry estimates ($ thousands)	Number of employees	Number of workstations
Transportation	42,218	765,354	9,709	1,237
Health	26,589	538,588	12,704	1,493
Revenue	23,861	191,344	4,106	1,516
Community & Social Svces.	21,880	442,426	11,164	433
Natural Resources	21,068	474,333	5,628	759
Education	16,921	132,909	2,292	390
Attorney General	12,222	253,504	5,498	325
Housing	12,093	59,723	1,275	812
Solicitor General	10,228	366,917	6,756	442
Environment	10,051	211,934	2,562	383
Government Services (excl. CTS)	9,946	409,606	3,227	222
Consumer & Commercial Rel.	8,717	91,713	2,372	692
Agriculture & Food	8,487	128,394	2,275	340
Labour	7,730	93,839	1,736	367
Correctional Services	6,997	329,055	7,086	455
Treasury & Economics	3,775	62,951	432	267
Northern Dev. & Mines	3,710	118,312	694	142
Municipal Affairs	3,267	(1,998)	553	167
Industry, Trade & Tech.	3,181	64,323	753	276
Skills Development	3,159	38,090	557	112
Colleges & Universities	2,302	7,725	267	172
Management Board/HRS	2,015	192,512	426	236
Culture & Communications	1,564	40,977	983	99
Tourism & Recreation	1,550	65,875	938	91
Energy	1,100	32,987	227	22
Financial Institutions	561	22,116	368	21
Intergovernmental Affairs	104	5,999	76	13
All ministries	**265,294**	**5,139,508**	**84,664**	**11,484**

NOTES: Info tech spending = ministry's total spending on information technology
Ministry estimates = ministry's total spending

TABLE 16: COMPARISON OF ACTUAL VS. ESTIMATED INFORMATION TECHNOLOGY SPENDING ($ thousands)

	1983-84				1984-85				1985-86			
	estimate	actual	var.	% var.	estimate	actual	var.	% var.	estimate	actual	var.	% var.
Agriculture & Food	2,399	3,813	1,414	59	1,442	4,970	3,528	245	4,433	5,323	890	20
Attorney General	6,205	5,380	(826)	–13	6,422	6,260	(162)	–3	6,312	5,364	(948)	–15
Colleges & Universities	–	–	–	–	–	–	–	–	–	245	245	–
Community & Social Servs.	12,509	11,843	(666)	–5	11,534	13,129	1,595	14	13,836	19,002	5,166	37
Consumer & Comm. Relns.	7,068	6,297	(771)	–11	7,697	8,483	786	10	9,006	6,081	(2,925)	–32
Correctional Services	2,209	2,691	482	22	2,418	2,709	291	12	2,976	4,187	1,211	41
Culture & Communications	818	628	(190)	–23	599	803	203	34	1,518	1,735	217	14
Education	5,664	6,112	447	8	6,062	7,273	1,211	20	7,894	9,837	1,943	25
Energy	255	259	4	2	353	550	197	56	548	877	329	60
Environment	2,956	3,864	908	31	2,638	4,489	1,851	70	5,208	6,313	1,105	21
Govt. Services (excl. CTS)	9,643	11,442	1,799	19	9,819	10,351	532	5	11,709	10,267	(1,442)	–12
Health	16,662	14,578	(2,084)	–13	17,899	16,094	(1,805)	–10	17,208	18,175	967	6
Housing	9,273	9,579	307	3	12,849	10,175	(2,675)	–21	10,995	11,168	173	2
Industry, Trade & Tech.	1,524	2,240	716	47	1,630	2,848	1,218	75	3,525	2,558	(967)	–27
Intergovernmental Affairs	95	95	0	0	26	50	24	91	29	18	(11)	–38
Labour	3,027	2,449	(578)	–19	3,183	2,589	(594)	–19	2,625	2,687	62	2
Management Board/HRS	777	729	(48)	–6	799	2,251	1,452	182	1,358	1,875	517	38
Municipal Affairs	–	–	–	–	–	–	–	–	–	2,535	2,535	–
Natural Resources	7,342	7,582	240	3	6,678	8,289	1,611	24	11,275	11,949	674	6
Northern Dev. & Mines	44	337	293	666	47	370	323	687	448	1,562	1,114	249
Office of the Cabinet	–	–	–	–	–	–	–	–	–	69	69	–
Office of the Premier	–	–	–	–	–	–	–	–	–	18	18	–
Revenue	20,954	18,348	(2,607)	–12	23,004	20,031	(2,973)	–13	24,004	23,316	(688)	–3
Skills Development	–	–	–	–	–	–	–	–	–	1,778	1,778	–
Solicitor General	4,445	4,862	417	9	4,658	5,892	1,234	26	8,363	7,387	(976)	–12
Tourism & Recreation	740	1,335	596	81	777	1,715	938	121	2,110	1,303	(807)	–38
Transportation	23,289	28,860	5,571	24	25,048	32,962	7,914	32	35,539	34,162	(1,377)	–4
Treasury & Economics	2,955	2,754	(201)	–7	3,027	3,043	16	1	2,430	3,813	1,383	57
Total	**140,852**	**146,075**	**5,224**	4	**148,609**	**165,324**	**16,715**	11	**183,349**	**193,604**	**10,255**	6

NOTE: var. = variation

TABLE 17: USE OF CONSULTANTS AND CONTRACT PERSONNEL BY MINISTRY IN PERSON-YEARS*

	1982-83		1983-84		1984-85		1985-86		1986-87		% contract				
	gov.	cont.	gov.	cont.	gov.	cont.	gov.	cont.	gov.	cont.	82-83	83-84	84-85	85-86	86-87
Agriculture & Food	9	6	10	7	14	9	9	9	12	20	40	41	39	49	63
Attorney General	18	10	26	14	27	14	29	5	55	22	36	35	34	15	28
Colleges & Universities	–	–	–	–	–	–	–	–	15	7	–	–	–	–	31
Community & Social Servs.	25	38	66	45	67	31	108	25	113	34	60	41	32	19	23
Consumer & Commercial Rel.	14	17	17	5	23	10	34	3	49	6	54	23	29	8	11
Correctional Services	15	7	10	–	11	–	15	6	29	4	30	–	–	29	12
Culture & Communications	4	1	11	–	11	–	5	1	6	4	25	4	3	11	42
Education	53	43	34	9	31	28	98	23	123	20	45	20	47	19	14
Energy	2	1	–	–	–	–	2	1	3	4	20	100	20	23	53
Environment	15	5	11	6	13	5	24	17	28	24	25	35	28	42	46
Financial Institutions	–	–	–	–	–	–	–	–	4	1	–	–	–	–	20
Government Services (excl. CTS)	30	14	49	19	49	5	74	–	66	–	32	28	10	–	–
Health	70	41	72	17	93	8	49	13	59	15	37	19	8	21	20
Housing	22	46	36	21	34	14	41	19	50	26	67	36	29	32	34
Industry, Trade & Tech.	5	3	7	7	13	10	11	15	12	27	39	50	43	58	70
Intergovernmental Affairs	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Labour	11	7	13	–	13	–	15	1	23	1	39	–	–	3	3
Management Board/HRS	5	1	6	–	8	–	11	2	12	4	9	–	–	15	25
Municipal Affairs	–	–	–	–	–	–	15	3	14	3	–	–	–	14	16
Natural Resources	35	28	35	9	57	9	91	15	110	20	44	20	14	14	15
Northern Dev. & Mines	–	–	–	–	–	–	5	–	9	7	–	–	–	–	45
Office of the Cabinet	–	–	–	–	–	–	–	–	–	2	–	–	–	100	100
Revenue	49	53	63	24	67	25	91	29	91	27	52	28	27	24	23
Skills Development	–	–	–	–	–	–	6	15	26	8	–	–	–	71	24
Solicitor General	23	17	27	7	36	6	49	–	69	2	43	21	14	–	3
Tourism & Recreation	1	4	2	6	4	8	5	5	7	5	80	75	67	50	42
Transportation	68	36	207	45	191	37	220	19	229	23	35	18	16	8	9
Treasury & Economics	4	5	8	5	10	2	15	2	14	3	53	40	17	9	19
All ministries	**478**	**382**	**709**	**247**	**770**	**221**	**1,019**	**225**	**1,225**	**318**	44	26	22	18	21

NOTE:* excluding operations, data entry, and project and administrative support staff

TABLE 18: COMPARISON OF MINISTRIES BY SIZE OF INFORMATION TECHNOLOGY BUDGET, 1986–87

	Information technology budget ($ millions)			All ministries
	$20+	$8-20	$0-8	
Number of ministries	5	8	16	29
Share of total govt. infotech (IT) spending	51%	33%	16%	100%
Average IT spending ($ million)	27.1	11.1	2.6	9.2
Variance in actual vs. estimated spending (3-year avg.)	+4%	+5%	+30%	+7%
Percent of ministry spending	5.6%	5.4%	3.8%	5.2%
Percentage spent in systems branch	48%	47%	31%	45%
Average IT person-years	228	109	24	83
Growth (adjusted for inflation)				
5-yr. growth rate in ministry spending	2.9%	3.5%	–3.1%	1.7%
5-yr. growth rate in IT spending	15.4%	14.5%	25.8%	16.3%
Share of the IT budget				
Data processing services & support	27%	20%	16%	23%
Equipment				
• computers & other	21%	12%	17%	17%
• PCs, word processing	9%	13%	20%	12%
Data communications	6%	10%	5%	7%
Software				
• development & packages	9%	13%	12%	11%
• maintenance etc.	7%	8%	6%	7%
Information technology administration	21%	24%	24%	22%
Technology penetration				
IT as % of ministry spending	5.6%	5.4%	3.8%	5.2%
IT spending per employee ($)	3,131	3,377	2,717	3,133
Employees per workstation	8.0	7.3	6.2	7.4
Avg. number of PCs installed	236	252	97	158
Avg. number of workstations installed (incl. PCs)	1,088	451	153	396
Private sector utilization				
Avg. contract person-years per ministry	32	15	6	13
Contract as % of total person-years	14%	14%	23%	15%
Data processing services & support from private sector	17%	20%	40%	21%
Percent of all IT exps. in private sector	50%	52%	58%	52%
Avg. per ministry spent in priv. sect. ($ million)	13.5	5.7	1.3	4.7

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